



# NORTHERN HARDWOOD NOTES

## Optimum Germination Temperatures

Why is sugar maple abundant under nearly all stand conditions, and why do hemlock and yellow birch, although differing in tolerance, occur together as a type? At least part of the answer may have to do with the optimum germinating temperatures for their seeds.

Sugar maple seeds get the jump on the other common northern hardwood species by germinating as soon as the snow melts, at 34° F. If a sudden warm spell shoots temperatures higher, few seeds will germinate. This happened in the spring of 1978 when the bumper seed crop failed to germinate except in snowbanks along roads.

Both hemlock and yellow birch germinate best from 59 to 61° F and so get started together.

Unfortunately, research on optimum temperatures for germination is spotty due to lack of seed and low viability (at least 40 percent germination is necessary for evaluating optimum temperatures if the percent of filled seed is not predetermined). The following tables sum up what is known. Table 1 includes some typical northern species, both hardwood and conifer; table 2 is for conifers common in the region.

Table 1. — Percent germination at different temperatures over 30 days for typical northern hardwood species

Species	Degrees fahrenheit						
	34	44	54	64	74	84	94
Sugar maple	87	* <sup>1</sup>	*	*	— <sup>2</sup>	—	—
Northern red oak	90	*	*	*	0	—	—
White ash	52	50	*	56	*	74	—
Balsam fir <sup>3</sup>	0	*	66	85	86	92	—
Eastern hemlock <sup>4</sup>	—	—	67	64	*	*	—
Yellow birch	0	0	*	62	70	60	—
Northern white-cedar	—	*	*	52	48	80 <sup>5</sup>	—
ALL TEMPERATURES							
Quaking aspen <sup>6</sup>	92	93	94	94	92	90	75

<sup>1</sup>Less than 40 percent germinations.

<sup>2</sup> — Not tested.

<sup>3</sup>Fraser 1970.

<sup>4</sup>Olson, Sterns and Nienstaedt 1959.

<sup>5</sup>Other tests showed extremely high germination at 86° F.

<sup>6</sup>McDonough 1979.

Table 2. — Percent germination at different temperatures for conifers common in northern hardwood reaion

Species	Degrees fahrenheit						
	34	44	54	64	74	84	94
Black spruce <sup>1</sup>	0	24	72	81	78	71	35
White pine <sup>2</sup>	0	0	26	81	80	61	34
Jack pine <sup>3</sup>	0	0	61	80	83	81	78
Jack pine (Argonne Expt. Forest, WI)	0	*3	50	68	86	94	— <sup>4</sup>
Red pine <sup>2</sup>	0	0	49	95	95	96	92

<sup>1</sup>Fraser 1970c.

<sup>2</sup>Fraser 1970b.

<sup>3</sup>\*Less than 40 percent germinations.

<sup>4</sup>Not tested.

We can make a few generalizations:

- The commonest hardwoods generally germinate at low temperatures (table 1);
- Conifers germinate best at high temperatures (table 2).
- Aspen, a pioneer species, seems to do well at all temperatures.
- White ash, like aspen, also does well over a wide range of temperatures. (It is usually the second most abundant species in northern hardwood stands.)

The fact that hemlock and yellow birch germinate best around 60 degrees might explain why seedlings are commonly found on old logs where temperatures are higher than on the forest floor. Somewhat surprising are the high temperature requirements for northern white-cedar, a northern bog species (table 1). Some of the pines germinate at higher temperatures than cedar (table 2).

Achieving the temperatures necessary for germination is crucial for successful regeneration. By knowing these temperatures you can devise the best cutting practices to favor regeneration of one species over another.

## References

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